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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/043,860	01/09/2002	Chi-Wen Liu	67,200-624	8436

7590 02/27/2004

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EXAMINER

DEO, DUY VU NGUYEN

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 02/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/043,860

Applicant(s)

LIU ET AL.

Examiner

DuyVu n Deo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-6,9-13,15-19 and 21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-6,9-13,15-19 and 21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 5, 6, 10-12, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Torii (2002/0068451) and Miller et al. (US 6,464,568).

Torii describes a method for polishing a semiconductor wafer comprising: providing a wafer process surface having a layer of tungsten oxide overlying tungsten; removing the tungsten oxide by dipping the wafer in an alkali (or claimed basic solution) solution (paragraph [0033]); chemically mechanically polishing the wafer by applying abrasive slurry to the wafer process surface (paragraph [0036-0037]). Unlike claimed invention, Torii doesn't describe the step of cleaning the wafer by using a wet cleaning process or cleaning the wafer after polishing (claim 12).

Miller describes a similar method where he teaches of rinsing the wafer surface with DI water (claimed cleaning the wafer with a wet cleaning process) after each process steps including the step of removing the metal oxide and the polishing the wafer (col. 4, line 43-63). It would have been obvious for one skill in the art to modify Torii in light of Miller because rinsing the wafer with DI would clean the wafer of the used solution such as alkali solution so that it doesn't contaminate the next solution such as the slurry in order to polish the wafer with a reasonable expectation of success.

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Referring to claim 5, Torii describes the aqueous solution is an alkali solution, which would have a pH greater than 7.0 (please see cited art below). Unlike claimed invention, he doesn't describe the solution has a pH of greater than about 10. However, Miller describes that variation or modification can be made to the solution pH (col. 8, line 45-50) and pre-polish solution pH can be change by changing the concentration of various ingredients in the solution (col. 7, line 15-21). This would suggest that the pH is a result-effective variable that can be changed. Therefore, it would have been obvious to determine the pH of the solution (or etchant) through routine experimentation in order to obtain optimum pH for the removing of the metal oxide with a reasonable expectation of success.

Referring to claim 6, the aqueous alkali solution from Torii that contains KOH would read on claimed KOH and water.

Referring to claims 10 and 11, both Torii (paragraph [0036]) and Miller (col. 6, line 4) teaches the slurry including an oxidizer, H₂O₂, which would read on claimed polishing solution forming an oxide layer in-situ over the metal.

Referring to claim 21, it has no patentable weight since the claimed method for removing the oxide can be either wet or dry etching and Torii teaches using a wet etching.

3. Claims 3, 4, 9, 13, 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Torii and Miller as applied to claim 1 above, and further in view of Manos (US 5,672,212).

Unlike claimed invention, referring to claims 3, 4, 9, 13, 16, applied prior art of Torii and Miller doesn't describe the wet etching and rinsing the wafer while agitating the wafer by using megasonic energy. Manos teaches using megasonic energy for either cleaning or etching a wafer (col. 2, line 5-15). It would have been obvious for one skill in the art in light of Manos to use

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megasonic energy with cleaning and etching the wafer because Manos teaches that the megasonic radiates energy to increase the reaction rate in the tank (col. 1, line 44-47).

Referring to claim 17, Torii describes the aqueous solution is an alkali solution, which would have a pH greater than 7.0 (please see cited art below). Unlike claimed invention, he doesn't describe the solution has a pH of greater than about 10. However, Miller describes that variation or modification can be made to the solution pH (col. 8, line 45-50) and pre-polish solution pH can be change by changing the concentration of various ingredients in the solution (col. 7, line 15-21). This would suggest that the pH is a result-effective variable that can be changed. Therefore, it would have been obvious to determine the pH of the solution (or etchant) through routine experimentation in order to obtain optimum pH for the removing of the metal oxide with a reasonable expectation of success.

Referring to claim 18, the aqueous alkali solution from Torii that contains KOH would read on claimed KOH and water.

Referring to claim 19, it has no patentable weight since the claimed method for removing the oxide can be either wet or dry etching and Torii teaches using a wet etching.

Response to Arguments

4. Applicant's arguments with respect to claims 1, 3-6, 9-13, 15-19, 21 have been considered but are moot in view of the new ground(s) of rejection.

5. Applicant's arguments filed 1/2/04 have been fully considered but they are not persuasive.

Referring to applicant's argument that there is reason for combining the teachings of Miller and Torii because they teach removing different types of oxides prior to a polishing

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process, this is found unpersuasive because Torii teaches using W as an example (paragraph 0027) and he also teaches the metal film to be polish can be W, Al, Cu or the like. It shows that while W and Cu maybe two different metals; however, in the process of CMP the wafer, they would be equivalent and the process for polishing W would also can be applied to other metals including Cu, Al or the like with a reasonable expectation of success.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 571-272-1462. The examiner can normally be reached on 6:00-3:30; with alternate Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DVD
2/20/04

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER

